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Staff Report to the Board

Demand-Side Management and Demand Response in the Ontario Energy Sectors

January 23, 2004

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SUMMARY OF RECOMMENDATIONS

- A hybrid framework using both market-based and public-policy approaches should deliver demand-side management (DSM) and demand response (DR) activities in Ontario's energy markets.

- A Central Agency should be responsible for delivery of DSM and DR activities in Ontario's energy sectors.

- The Ministry of Energy, the Independent Electricity Market Operator (IMO) and the Ontario Energy Board should work together to coordinate DSM and DR activities.
  - The Ministry would be responsible for setting over-arching objectives for DSM and DR.
  - Where necessary, the IMO would make changes in the Market Rules to implement DR, and the Board would change regulatory instruments to facilitate DSM and DR activity. Both organizations would continue to carry out their legislated objectives.

- Transmitters and distributors should be allowed to act as delivery agents of DSM/DR activities for least-cost planning and/or optimizing their distribution systems. This might include investing in DSM/DR-enabling technologies such as meters, controllers, communications, and/or gateway services. In doing so, distributors should comply with Central Agency protocols and compete equally with private sector players, without provision for DSM variance account, lost revenue adjustment mechanism, or shared savings mechanism.

- The Board should put in place regulatory mechanisms to induce gas distributors, electricity transmitters and electricity distributors to reduce distribution system losses.

- The recommended framework should replace the current gas framework within three years.

- Electricity DSM and some retail DR initiatives should be funded by all electricity consumers through a transparent, non-bypassable consumption charge (kWh). Gas DSM initiatives should also be funded by a transparent consumption charge (m^3).
  - This charge would be levied on all consumers, including self-generation in electricity.
  - The Central Agency should be responsible for setting the rate applied to electricity and gas consumption annually, subject to review by a regulatory body.

- In consultation with stakeholders, the IMO should design and develop economic DR to be put in place for 3-5 years as a transitional measure.

- Further, the IMO should revise the Market Rules to facilitate load aggregation (e.g., statistical measurement, metering, and settlement requirements).

- No one player should be mandated to play the role of load aggregator.

- The Board is currently working on interim and long-term Standard Supply Service (SSS) pricing strategies. These could include peak and off-peak time-differentiated SSS prices altered seasonally.

- Until May 1, 2006, time-differentiated and seasonally adjusted commodity prices could apply to designated consumers.

- The agencies involved in conservation in Ontario (the government, the Central Agency, the IMO, and the Board), should coordinate consumer education plans to ensure consistent messages and avoid duplication.

- To help consumers understand their energy choices and the consequences of those choices in the Ontario market, the Board should design, develop and/or deliver information to consumers related to energy conservation, energy efficiency, load management and cleaner sources of energy.

1 INTRODUCTION

1.1 Background

The Ontario Energy Board received a directive from the former Minister of Energy under Section 27.1 of the *Ontario Energy Board Act, 1998* (OEB Act) on June 18, 2003. In it, the Minister directed the Board to consult with stakeholders on options for the delivery of demand-side management (DSM) and demand response (DR) activities within the electricity sector, including the role of local distribution companies in such activities. The directive also referred to the potential role for load aggregators within the markets administered by the Independent Electricity Market Operator (IMO). The directive asked the Board to balance implementation costs with the benefits to both consumers and the entire system. The Board is to report back to the Minister of Energy by March 1, 2004 with its analysis and recommendations for both the short and long term.

Record electricity demand since market opening in Ontario underscores the need for conservation. In August, 2002, the province set a new summer peak of 25,414 MW and in January, 2003, a new winter peak of 24,158 MW. August, 2003 would likely have seen a new summer peak if not for the blackout and Ontario consumers' response to the subsequent call for restraint. Demand in June had already reached 24,753 MW (just 661 MW short of the 2002 record). Already this year, on January 16, consumers set a new winter peak record of 24,982 MW.

The former Government also appointed a task force, the Electricity Conservation and Supply Task Force, to provide an action plan outlining ways to attract new generation and identifying mechanisms for DSM. On January 14, 2004 the Minister of Energy released the report of the Task Force. In his news release, the Minister confirmed the Government's commitment of "setting a new direction and developing a responsible and sustainable policy for Ontario's electricity

sector", including creating a conservation culture in Ontario. The conservation culture means "making conservation, demand management and demand response strategies a cornerstone of Ontario's long-term energy future."[1]

The Minister has announced the formation of a conservation action team to promote the government's conservation initiatives[2], and that he will seek a technical advisor to oversee a competitive contracting process to enhance Ontario's supply of renewable energy[3].

In its recommendations, the "Task Force endorses the process currently under way at the Ontario Energy Board which is expected to provide more detailed advice to the Government in the spring of 2004 on the appropriate organization and funding of conservation in Ontario."[4]

1.2 Definitions

Such commonly used terms as "energy conservation", "energy efficiency" and "load management" may mean different things to different people. Such terms are central to the Board's response to the directive, but are not defined in the current legislation. This section explains, therefore, what is meant by various terms as they are used in this paper[5].

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[1]Ontario Ministry of Energy News Release. "Electricity Conservation And Supply Task Force Report Confirms Need For New Direction In Ontario's Electricity Sector". January 14, 2004.

[2]Ontario Ministry of Energy News Release. "McGuinty Government Takes Action On Conservation". January 16, 2004.

[3]Ontario Ministry of Energy News Release. "Energy Minister Announces Plan to Address First Third of Coal Commitment". January 20, 2004.

[4]Electricity Conservation and Supply Task Force. "Tough Choices: Addressing Ontario's Power Needs" Final Report to the Minister. January 2004.

[5]Two supporting definitions are worth noting here as they are conceptually referred to in a number of the working definitions. According to *The Power Reference* by Ontario Power Generation, "Demand" means the rate at which electricity or natural gas is delivered to or by a system in a given instant, or averaged over a designated period, usually expressed in m^3/hr

Energy Conservation means any action that results in less energy being used than would otherwise be the case. These actions may involve improved efficiency, reduced waste or lower consumption, and may be implemented through new or modified equipment or behaviour changes.

Energy Efficiency means using less energy to perform the same function. This may be achieved by substituting higher-efficiency products, services, and/or practices. Examples include high-efficiency appliances, efficient lighting programs, high-efficiency heating, ventilating and air conditioning systems or control modifications, efficient building design, advanced electric motor drives, and heat recovery systems. Energy efficiency can be distinguished from demand-side management in that it is a broad term that is not limited to any particular sponsor (e.g., a utility, a retailer, an energy services company).

Load Management means activities or equipment to induce consumers to use energy at different times of day or to interrupt energy use for certain equipment temporarily in order to meet the objectives of peak shaving and/or load shifting from peak to off-peak. Examples include interruptible rates, time-of-use rates, load control devices, and air conditioner cycling programs.

Demand-side management[6] (DSM) means actions which result in sustained reductions in energy use (KWh, m^3) for a given energy service, thereby reducing long-term energy and/or capacity needs.

Demand response (DR) means actions that result in short-term reductions in peak energy demand (MW, m^3/hr).

(natural gas) or kW (electricity); and "Energy consumption" means the quantity of energy used, typically expressed as m^3 (natural gas) or kWh (electricity).

[6]These working definitions for DSM and DR were developed by the Advisory Group.

It is important to note that these terms are not mutually exclusive. For example, energy conservation includes energy efficiency; and energy conservation or energy efficiency may be achieved through load management measures. Similarly, demand-side management involves all three concepts – energy conservation, efficiency and load management. In general, energy conservation is the broadest term; energy efficiency has a strong technology focus; and load management may or may not result in the use of less energy, but at a minimum it shifts the timing.

1.3 Board Approach to Developing Recommendations

The Board announced its plan for carrying out the directive and expanded the scope of review to include the role of gas distribution companies in DSM. The Board invited stakeholders to participate in a consultation process. The Board received 139 responses. These respondents formed the group of Listed Stakeholders.

A staff discussion paper presented results of preliminary research on DSM and DR to Listed Stakeholders.

An Advisory Group of 31 stakeholders was selected from the Listed Stakeholders to represent identifiable constituencies, including consumers, special interest groups, trade associations, generators, transmitters, electricity and gas distributors, wholesalers, retailers, and technology and energy service providers.

Starting on October 22, 2003, the Advisory Group held 14 days of meetings over an eight-week period. It heard fourteen stakeholder oral presentations on October 29 and 30. With Board staff and the assistance of a facilitator, the group analyzed and evaluated options; prepared action plans for overcoming identified barriers, issues and stakeholder concerns; and prepared a report.

The "Report of the Advisory Group on Demand-Side Management and Demand Response in Ontario in Response to the Minister's Directive to the Ontario Energy Board" brings together the group's working documents and represents its deliberations. It does not set out a consensus position. Instead it details several alternatives. The report contains:

- a discussion of market issues;
- an outline of options for delivering DSM and DR in Ontario:
  - a DR framework;
  - options for a Central Agency framework; and
  - an option for an "Ontario Energy Board/wires company" framework; and
- a discussion of general issues.

By November 19, the Board received 28 stakeholder written representations. A list of stakeholder oral presentations and written representations is included in Appendix A.

The report of the Advisory Group and Stakeholder submissions presented reasoned and varied points of view. Subsequently, the Board asked staff to prepare this Report to the Board. In doing so staff have drawn on the stakeholder oral presentations, written representations, the report of the Advisory Group and staff's original Discussion Paper. Staff note that the report of the Advisory Group will continue to be useful as a framework is put in place.

The Board wishes to receive stakeholder comments on staff's Report to the Board before deciding on its recommendations to the Minister.

1.4 Energy Market Issues

The Advisory Group discussed market changes that would lead to greater efficiency. As outlined in the "Market Issues" section of the report of the Advisory Group, these would address issues including:

- unequal treatment of demand-side and supply-side resources;
- artificial/inefficient pricing (and lack of transparency);
- Ontario Power Generation market power;
- forward price uncertainty;
- transmission rate structure; and
- "use it or lose it" budget practices in government-funded buildings.

DSM and "economic DR" (usually understood to mean payments for curtailment) would target remaining barriers to efficiency. However, it should be noted that many Advisory Group members objected to the implication that curtailment payments are always economic or that DR without such payments is not economic.

2 RECOMMENDED POLICY DIRECTION

Recommendation:

A hybrid framework using both market-based and public-policy approaches should deliver DSM and DR activities in Ontario's energy markets.

A hybrid framework achieves DSM and DR goals in a variety of ways. Using market forces may be the best means to optimize the system to ease short-term capacity constraints. Making long term, sustainable changes in the market, on the other hand, may best be achieved through public policy.

In Ontario's electricity sector, a key policy driver in the short term is system optimization[7] through DR to:

- meet Ontario's energy needs;
- promote load management (system benefits);
- promote wider-based consumer participation in the electricity markets than is currently afforded by the real-time energy market (e.g., in the case of DR to bridge between wholesale and retail markets; load aggregation);
- reduce overall electricity prices to consumers;
- reduce electricity price volatility; and
- avoid uneconomic investments in generation, transmission or distribution.

[7] Maximizing use of the existing infrastructure through balancing investment in new generation, transmission and/or distribution upgrades, and DSM and DR activities. For a discussion of system reliability as a function of the relationship among generation, wires, and load, see: Richard Cowart, "Efficient Reliability: The Critical Role of Demand-side Resources In Power Systems and Markets", Prepared for The National Association of Regulatory Utility Commissioners, June, 2001.

In Ontario's gas and electricity sectors, the longer-term policy objective should be market transformation[8] through DSM to:

- induce lasting structural and behavioral changes in the market place to create a conservation culture;
- increase Ontario's competitiveness through increased energy productivity; and
- provide universality - i.e., allow as many consumers as possible the opportunity to participate and share in the benefits of demand-management activities (public benefits).

Ontario will need both DSM and DR to meet its objectives and resource goals.

Pricing to consumers also has an impact on a DSM/DR framework. In a fully-functioning competitive market, market-based pricing tends to lead to efficient levels of demand. Consumers change the amount or timing of their energy consumption, or contract to hedge against price volatility. demand-management services could be competitively offered to consumers by energy services companies or packaged with generation and financial services by retailers and power marketers. Under regulated pricing, however, moving to efficient levels of demand depends on public policy and regulatory oversight.

Ontario currently uses both forms of pricing for electricity. Designated consumers[9] pay a fixed price, while wholesale market participants and non-designated consumers pay the hourly Ontario energy price, unless they contract for a fixed price. In summary, commodity pricing in Ontario differs depending on

[8]The American Council for an Energy-Efficient Economy (ACEEE) defines market transformation as: "Reducing market barriers to the adoption of cost-effective energy efficiency products and services in a sustained manner." For example, when an energy efficient option becomes the norm through an increase in minimum standards. A recent example of this in Ontario is gas water heaters.

[9]Defined in section 56 of the OEB Act and associated regulations.

consumer size (annual demand and/or consumption), market participation (wholesale or retail), and choice (default supply or competitive supply).

Since system optimization and market transformation are not mutually exclusive, and commodity pricing is both market-based and regulated, a hybrid approach using both market-based and public-policy based approaches is recommended for Ontario.

3 RECOMMENDATIONS FOR IMPLEMENTING DEMAND-SIDE MANAGEMENT ACTIVITIES

3.1 Policy Framework

Recommendations:

A Central Agency should be responsible for the design and delivery of DSM and DR activities in Ontario's energy sectors.

The Ministry, the IMO, the Board and the Central Agency should work together to coordinate DSM and DR activities.

- The Ministry would be responsible for setting over-arching objectives for DSM and DR.
- Where necessary, the IMO would make changes in the Market Rules to implement DR, and the Board would change regulatory instruments to facilitate DSM and DR activity. Both organizations would continue to carry out their legislated objectives.

No one player has a primary role in all stages of the DSM/DR implementation process.

The Central Agency would be responsible for:

- developing the province-wide DSM/DR plan (including conservation fund administration, target market plans, budget allocations, and market transformation initiatives);
- setting rules for screening opportunities and monitoring and evaluation protocols;
- identifying broad areas of opportunity in DSM and DR;
- contracting for and coordinating design and delivery of programs;
- contracting for an independent audit of results; and

- providing an annual report to the Minister.

The Central Agency should also be involved in province-wide DR activities, particularly in the retail market. However, the IMO should oversee DR in the markets it administers. Early coordination with the IMO would help to leverage or expand upon the services that the IMO provides to support province-wide demand-side strategies and objectives. This is discussed further in chapter 4 of this report and in the IMO's written representation.

To encourage the development of a competitive energy services sector, private sector delivery agents should be used as much as possible. A thriving energy services sector will offer cost effective solutions to consumers. As the conservation culture develops, a competitive energy services market would eventually drive conservation without additional funding from ratepayers.

The Ministry could create a new entity to be the Central Agency, or could designate the role to an existing agency.

In some jurisdictions the state acts as a Central Agency. The Advisory Group objected to the government taking an active role in implementation although it did recommend that the ministry set overarching objectives for DSM and DR (such as peak demand and consumption reduction targets). Also, the group recommended that the government continue to improve the efficiency of buildings and products through building codes and product standards.

Independent system operators do not take a lead role in DSM in other jurisdictions. It is often seen as a conflict with their role as impartial manager of the market system.

Figure 1 presents the results of a jurisdictional survey undertaken by the Regulatory Assistance Project [10]. Program administration (the role of the Central Agency) is not dominated by any single model. Program administration models include: Central Agency (21%); the government or regulator (27%); distributors (26%); and vertically integrated utilities (26%). In many jurisdictions, a blend of players is used to implement DSM activities, including private and public sector utilities.

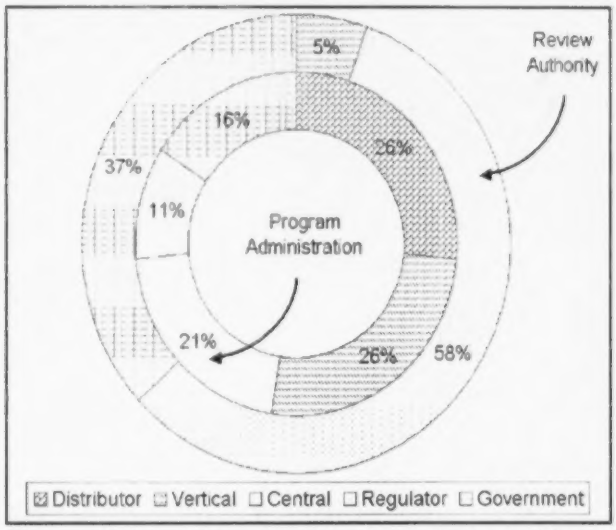

Figure 1: Administrative Structures (adapted from "Who Should Deliver Ratepayer Funded Energy Efficiency?")

In all jurisdictions the Program Administrator is overseen by a Review Authority. In 58% of the jurisdictions surveyed, the regulator is the review authority.

3.1.1 Rationale

The Central Agency Model

A coordinated approach to DSM is necessary in Ontario to prioritize and implement public policy goals. A Central Agency is also effective at addressing market transformation issues, setting appropriate targets, ensuring universal access, maximizing consistency and reducing administrative burden.

[10] Harrington, Cheryl and Catherine Murray, The Regulatory Assistance Project. "Who Should Deliver Ratepayer Funded Energy Efficiency?" A Survey and Discussion Paper May 2003.

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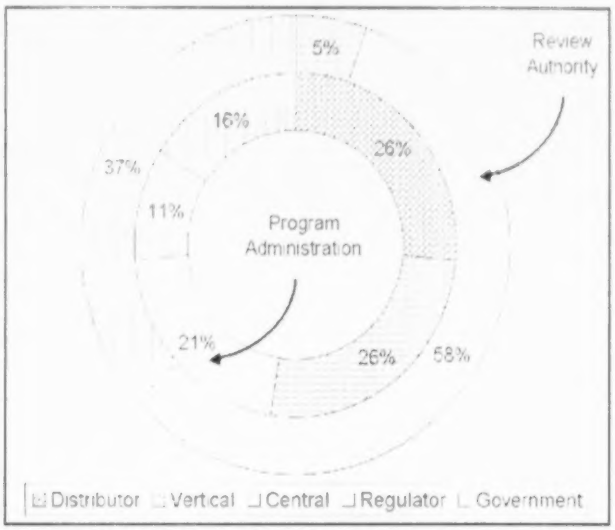

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[10] Harrington, Cheryl and Catherine Murray, The Regulatory Assistance Project. "Who Should Deliver Ratepayer Funded Energy Efficiency?" A Survey and Discussion Paper. May 2003.

The report of the Advisory Group discussed the central agency model without making a definite recommendation. It noted that the central model can be more effective, provide greater universality, and develop the competitive sector, because:

- It provides a single point of contact for all players.

- It allows economies of scale through consistent, province-wide policies. Energy service product prices and transaction costs should therefore be lower because delivery agents can develop marketing programs for the entire province using their existing delivery channels. These scale economies are also likely to attract more private sector participants.

- It can reflect regional needs through consultation with local stakeholders.

- Consumers with multiple locations around the province (such as chain accounts and property management firms) also benefit from more consistent program rules.

- All activities can be screened, tracked, and evaluated with a single set of protocols, allowing for consistent comparison of results regardless of the delivery agent.

An alternative to the Central Agency model is the use of utilities to deliver DSM and DR activities. Research suggests that the strengths of the Central Agency model over the utility model include the ability to:

- focus its mission;
- eliminate conflicting business objectives; and

- achieve a high degree of compatibility with broader public policy goals.[11]

The OEB – Utility Model

In addition to the Central Agency model, the Advisory Group described a utility model where the Board oversees activities undertaken by utilities.

There is support among stakeholders for a primary role in DSM and DR for distributors. Distributors understand their local market conditions and their customers, and proponents maintain that this would allow distributors to design highly effective programs for their customers. Further, distributors' long-term relationships with consumers establish a high level of trust.

The report of the Advisory Group notes that the utility model may not adequately address central issues such as standards and market transformation initiatives. However, it may be appropriate for system optimization purposes. See section 3.2 in this report.

Concerns about the utility model include:

- Energy efficiency programs should be province-wide for consistent coverage. The patchwork coverage through utilities tends to result in a confusing variety of programs for consumers.

- Utilities often integrate their DSM/DR programs into marketing strategies for building load and retaining customers. These competing goals subordinate the goal of conservation.

[11] Harrington, Cheryl and Catherine Murray, The Regulatory Assistance Project. "Who Should Deliver Ratepayer Funded Energy Efficiency?" A Survey and Discussion Paper May 2003.

- If a utility is to pursue energy efficiency for social benefits, then the utility may need to get large incentive payments and revenue protection to overcome business conflicts. This compensation comes directly from consumers.

  In Ontario's gas sector, there are three regulatory mechanisms: a DSM variance account (DSMVA), the lost revenue adjustment mechanism (LRAM), and the shared savings mechanism (SSM). The DSMVA allows the distributor to recover overspending of the DSM budget if the additional savings warrant it. As defined in the July 23, 1993, E.B.O. 169-III Report of the Board, a "lost revenue adjustment mechanism" is a technique which allows the utility to recover, in its rates, the revenue loss associated with a specific DSM program or set of programs; and a "shared savings mechanism" is a regulatory incentive to the utility's shareholders whereby they are allowed to retain a portion of the net dollar benefit from a DSM program or set of programs.

- A study of U.S. jurisdictions found that utility-led and Central Agency-led models have similar administration costs. In addition, utility incentives can be as much again as those administration costs[12]. In Ontario's gas sector, regulatory oversight of these payments has proven to be complex and controversial. This regulatory complexity may be compounded by the number and variety of electricity distributors.

[12]Guinn, C. "Briefing Report: Status of Public Benefit Programs". Prepared for the National Association of State Energy Officials. *Undated.*

Figure 2[13] shows that the incentive payment to Enbridge Gas Distribution Inc. shareholders in 2001 was 28% of all DSM spending. Union Gas Limited does not have a shareholder incentive mechanism; however, revenue protection for Union in 2001 was 42% of total DSM spending.

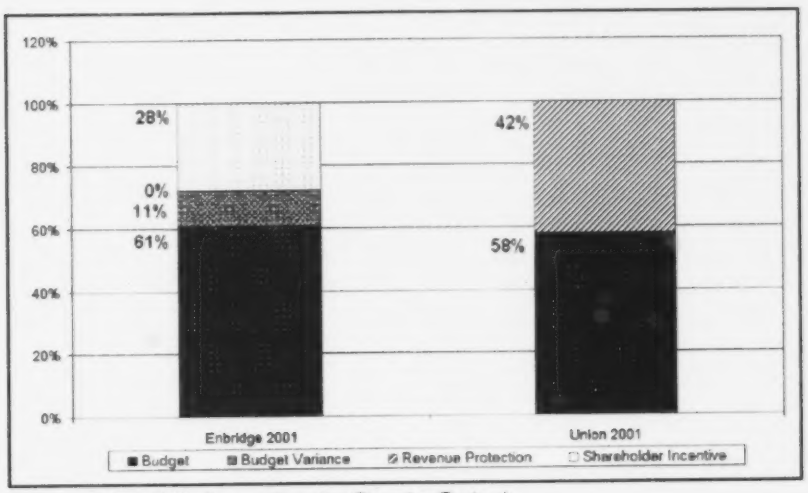

Figure 2: DSM Spending in Gas in Ontario

- The utility model is inconsistent with the restriction on business activities that attempts to make distributors neutral to market forces. Other market players believe that utility-based administration is a conflict of interest for the utility that gives it an unfair advantage in the energy services market. There is relatively little experience in DSM with the electricity distributors. That inexperience and the resources required would likely lead those distributors to outsource to a larger third party.

[13] Source data for this graph is the Enbridge Distribution Inc. RP-2002-0133 Partial Decision with Reasons, and the Union Gas Limited DSM 2001 Evaluation Report and evidence filed in the Union Gas Limited RP-2001-0029 rate case.

3.1.2 Potential Concerns

Stakeholders were concerned about bureaucracy and the risk of a Central Agency becoming self-perpetuating. The Central Agency must achieve adequate oversight with the lightest possible administrative burden so that conservation funds are used most effectively. Up-front rule-making so that the operating environment is clear would reduce these concerns. Transparent reporting of results and periodic review of effectiveness would ensure that the agency was accountable and did not outlive its usefulness.

Some members of the Advisory Group considered that mandating a market regulator to act as the Central Agency would conflict with the regulator's role. There is concern that by actively designing, implementing, and funding DSM/DR activities, a regulator would intervene in the market it is meant to oversee.

3.1.3 Implementation

The Ministry may have to implement legislation to create a new entity to be the Central Agency, or to designate the role to an existing agency.

3.2 The Role of The Transmitter And Distributor

Recommendations:

Transmitters and distributors should be allowed to act as delivery agents of DSM/DR activities for least-cost planning and/or optimizing their distribution systems. This might include investing in DSM/DR-enabling technologies such as meters, controllers, communications, and/or gateway services. In doing so, distributors should comply with Central Agency protocols and compete equally with private sector players, without provision for DSM variance account, lost revenue adjustment mechanism, or shared savings mechanism.

The Board should put in place regulatory mechanisms to induce gas distributors, electricity transmitters and electricity distributors to reduce distribution system losses.

3.2.1 Rationale

Least-Cost Planning

Letting transmitters and distributors act as delivery agents will enable them to balance infrastructure upgrades with load management options for least-cost planning. An option might include aggregating local distribution system load. Otherwise ratepayers are paying for uneconomic investments that could have been avoided.

As discussed in section 3.1, the Central Agency would use private sector delivery agents as much as possible. This would give the transmitters and distributors the option of entering into performance contracts with delivery agents for DSM/DR resources. Performance contracts would allow them to mitigate risk. In

fulfilling the contract, the delivery agent may offer activities supported by the conservation fund.

Reducing Distribution System Losses

Currently, electricity distributors are indifferent to losses because they are treated as a passthrough to consumers. This could lead to distributors making decisions based solely on the initial capital cost rather than the life cycle cost since losses are passed on to the consumer.

Peak conditions are critical to the electricity system as a whole and distributors in particular. "Meeting system needs at peak require allowances in system design and operations for a typically less than optimal load factor. Optimal asset utilization or, alternatively, component loading often suffer as a consequence. It is at these times when the system also experiences the greatest losses."[14] DSM and DR can mitigate system losses and distributors should be encouraged to pursue these activities at optimal times when those activities most benefit them. "Invariably, those times correspond to peak demand periods. Losses are much higher during peak demand periods because they vary as the square of the current, or system load."[15]

3.2.2 Potential Concerns

Least-cost planning calls for a sufficiently long horizon, for example at least 10 years, to allow DSM/DR to be a viable alternative when considering investments.

[14] EnerSpectrum. Ontario Energy Board Stakeholder Consultations - RP-2003-0144 Minister's directive on DSM and DR October 2003. November 10, 2003.

[15] Ibid.

However, distributors should be made aware that the utility cost test[16] should be used so that ratepayers do not subsidize societal benefits.

One concern for distributors is that DSM/DR activities sponsored by the Central Agency might be so successful that throughput is significantly eroded during a multi-year performance-based regulatory (PBR) term. The Board may need to consider rate relief in such cases. This does not mean LRAM or SSM, but an adjustment to forecasted throughput for recovery of revenue requirement.

3.2.3 Implementation

The Board is currently planning for the second generation of electricity distribution PBR. In that work the Board should review the regulatory treatment of distribution system losses (as a potential incentive for making the distribution system more efficient). It should also consider the need for mid-term adjustments to load forecasting to take into account the impact of conservation initiatives.

3.3 Symmetry Between Electricity and Gas

Recommendation:

The recommended framework should replace the current gas framework within three years.

3.3.1 Rationale

A Central Agency could oversee DSM in gas as well as electricity. It would allow a focused effort on market transformation and provide unbiased decision-making

[16] An evaluation of the impact of a DSM program on a utility's revenue requirement as a result of a change in costs. Excludes any lost revenues due to the DSM program. E.B.O. 169-III Report of the Board, July 23, 1993

on fuel switching and potential load growth issues. Further, it could provide comprehensive programs that address all energy sources available to the consumer whether at one location or many locations across the province.

Implementation of DSM should be the same in gas as in electricity. Otherwise, gas distributors could structure programs to their competitive advantage.

However, putting a DSM framework in place for electricity - establishing the policy foundation and operating norms - will take time. It is not advisable to add natural gas immediately. While DSM in electricity is maturing, the natural gas distributors will provide gas savings and prepare for the new framework without undue disruption to their business and marketing strategies.

3.3.2 Potential Concerns

The gas distributors have built considerable experience in DSM program development and administration. Successful programs could be transferred to the Central Agency (using the same delivery partners) where they would be subject to the same monitoring and evaluation criteria as electricity programs. In the meantime, gas distributors might focus on superficial projects to maximize incentive payments.

3.3.3 Implementation

The Board would continue to oversee gas cases on an individual basis with the goal of transferring responsibility to the Central Agency.

3.4 Conservation Funding

Recommendations:

Electricity DSM and some retail DR initiatives should be funded by all electricity consumers through a transparent, non-bypassable consumption charge (kWh). Gas DSM initiatives should also be funded by a transparent consumption charge (m^3).

- This charge would be levied on all consumers, including self-generators in electricity.
- The Central Agency should be responsible for setting the rate applied to electricity and gas consumption annually, subject to review by a regulatory body.

DSM funding should cover DSM/DR program administration and consumer incentives. It would not include funding for lost revenue adjustment (LRAM), variance accounts (DSMVA) or shared savings mechanisms (SSM).

The consumption charges paid by consumers would flow to the Central Agency to administer as a conservation fund.

The government has proposed that the funds from one year of the third phase of electricity distribution market-based rate of return (MBRR) be used to fund conservation and demand management. For these funds to be available, distributors would have to apply for, and receive the Board's approval for these increases. It is not certain that all distributors will apply for the maximum allowable. However, estimates put the upper boundary at $240 million[17] on consumption of 150 to 155 terawatt hours[18]. This represents an average charge of about 0.16¢ per kWh. Staff estimate that in 2001, the average charge per m^3

[17] Value of 3rd tranche of MBRR from Rates spreadsheet (January 18, 2003).

[18] Estimate of 12 month Ontario demand based on historical figures from the IMO website.

of gas for Enbridge was 0.15¢, and for Union 0.05¢. This level of funding may suggest that 0.15¢ per unit could serve as a baseline for the consumption charge in future years to be set by the Central Agency.

3.4.1 Rationale

All DSM and DR funding comes ultimately from the consumer regardless of the method of collection (i.e., tax, distribution rate, or uplift charge). Therefore, a non-bypassable commodity charge is appropriate. Knowing that a charge on use is being collected spurs consumers to conserve. It shows clearly that the government sees the societal importance of conservation. Conversely, consumers would resent an increase in distribution rates without a demonstrable benefit.

A mil rate based on consumption makes sense because the more energy a consumer uses the more he or she should be able to conserve.

3.4.2 Potential Concerns

A Central Agency can help to resolve questions of funding:

- Should funds collected from the two energy sectors be allocated within those energy sectors? To ensure that DSM activities may be available to both electricity and gas consumers, gas funding may need to be allocated to programs in gas. Avoided cost[19] calculations in electricity are often high because of avoided capital generation costs. As well, benefits to electricity consumers usually include higher bill savings. Therefore, total

[19] The total supply-side costs that are not incurred, or deferred into the future, as a result of the implementation of a DSM program. Avoided costs are usually taken to be the full marginal or incremental costs of supply that will be avoided. E.B.O. 169-III Report of the Board, July 23, 1993.

resource cost[20] (TRC) test results in electricity are often higher than in gas. This does not necessarily mean that the program costs will be higher. Therefore, if gas and electricity activities are screened together, it would result in few if any gas opportunities being targeted.

- Should the conservation fund be allocated to the customer classes from which it is collected? In many jurisdictions, funding is dedicated to areas where the market will not serve (i.e., low and fixed-income, residential markets, and new technologies/standards). Staff note that in the United States, low-income programs are frequently administered either directly by the State or a newly created entity with public oversight.[21]

  There are three generally accepted principles to DSM funding: equal mil rate collection across all customer classes; budget allocation proportional to collection; and maximizing TRC benefits. Concern was raised in the Advisory Group that it is not possible to satisfy all three at the same time - trade-offs will be necessary. For example, residential programs typically have high program costs relative to the savings generated, while industrial programs have low program costs relative to the savings generated. Therefore, selecting programs based solely on maximum TRC benefits will result in lost opportunities in the residential sector. On the other hand, allocating funds strictly to customer class may leave some industrial or commercial projects unfunded resulting in lost opportunities in those sectors and lower overall TRC benefits.

- How much of the conservation fund should be spent to enable increased DR at peak periods (i.e., through investment in enabling technologies such as meters, controllers, communications, and/or gateway services)?

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[20] An evaluation of the costs and/or benefits accruing to society as a whole, due to an activity, with the exception of externalities. E.B.O. 169-III Report of the Board, July 23, 1993.

[21] See also the written representations of the Vulnerable Energy Consumers Coalition and the Canadian Environmental Law Association. November 10, 2003.

- Should the gas consumption charge be levied on gas-fired generators, regardless of size or use? Since the electricity charge would be levied on all electricity consumed, this could be considered double taxation.

3.4.3 Implementation

The government should legislate the basis for the electricity and gas consumption charges.

The charges might be collected in a way similar to the debt-retirement charge in the electricity sector and remitted to the Central Agency.

3.5 Summary

In summary, Figure 3 depicts the recommended framework showing the flow of funds, and the relationships between the major players.

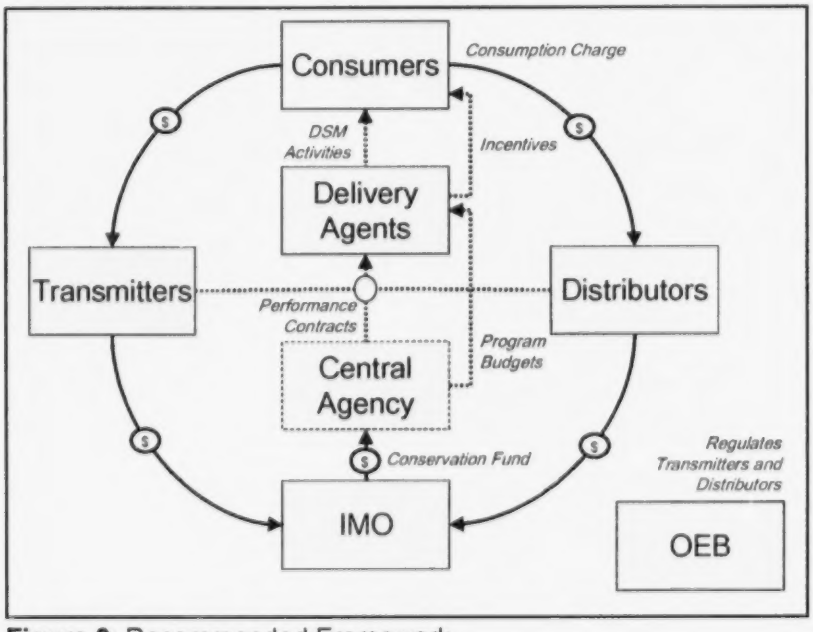

Figure 3: Recommended Framework

4 RECOMMENDATIONS FOR DEMAND RESPONSE

4.1 Demand Response in the IMO-Administered Markets and Load Aggregation

Recommendations:

In consultation with stakeholders, the IMO should design and develop economic DR to be put in place for 3-5 years as a transitional measure.

Further, the IMO should revise the Market Rules to facilitate load aggregation (e.g., statistical measurement, metering, and settlement requirements).

No one player should be mandated to play the role of load aggregator.

4.1.1 Rationale

DR is a necessary part of a functioning market. It is an economic decision to forgo production or a service (air conditioning, escalators, etc) or to switch to an alternative fuel based on the price of the commodity.

Natural DR in the wholesale energy market gives two benefits to the bidder: consumption is foregone at the higher price; and the bid contributes to a lower market-clearing price for what is consumed. The market also benefits: the bid is seen in the market; and there is less difference between the pre-dispatch price and the market-clearing price. The rest of the market participants benefit too: their consumption is priced at the lower market-clearing price.

Economic DR achieves all of these benefits. However by adding a payment into market settlement, it distorts the market. It creates a wider range within which it makes economic sense to forego production and, by extension, the associated

benefits to society, such as jobs. On the other hand, the payments to a few consumers to curtail at peak periods are dwarfed by the savings to all consumers in terms of lower market-clearing prices. "The few examples that have been observed indicate that when supply is scarce relative to expected demand a reduction in demand of 2-5 percent could reduce prices by half or more."[22] This suggests that the market saves $9.50 for every $1 of incentive payment to responding load.

The demand response side of the Ontario market was not emphasized in market design. Ontario Hydro, the vertically integrated utility, charged interruptible rates largely to industrial and large commercial entities with dual fuel capability that were rarely curtailed. This was a set payment for an unlikely event. Some distributors had programs with a flat fee payment to get internal system benefits from peak shaving. The programs used set timers or ripple control.

The current Ontario demand curve does not reflect true DR. The report of the Advisory Group[23] discusses this in more detail. This distortion is exacerbating price transparency problems that are evident in the difference between the pre-dispatch price and the market-clearing price. Economic DR is justified as a transitional tool. It would create a more realistic demand curve until the market is mature. The objective would be to let consumers participate in the wholesale market. The IMO and the Board, as part of their market surveillance responsibilities, would review market conditions to determine when economic DR could be discontinued.

It is in the high-price section of the supply curve that the most dramatic price changes could result from small demand changes. Therefore economic DR

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[22]Rosenzweig, Michael, et al. "Market Power and Demand Responsiveness: Letting Customers Protect Themselves". The Electricity Journal. May 2003.

[23]See also the written representation to the Board of the Association of Major Power Consumers in Ontario. November 18, 2003.

should be active only in periods when the price is above a threshold. For example, in Ontario between May 1, 2002 and October 31, 2003 the three-hour ahead price was above $180 for a total of 406 hours[24] out of 13,152 hours (approximately 3% of the time).

The IMO is currently developing a short-term economic DR program for use where a verifiable barrier exists. The rules are not final, but the program as proposed by the IMO could work as follows:

> A wholesale economic DR participant, or load aggregator, offers to curtail use of 2 MW if the three-hour pre-dispatch price exceeds $180/MW (the threshold price). The IMO would call for the curtailment when the pre-dispatch price exceeds the threshold price. Regardless of the eventual market-clearing price, the participant would receive a payment of: ($180/MW) x (the actual measured load curtailment) x (the required number of hours for curtailment).

[24] Independent Electricity Market Operator. Presentation at Economic Demand Response Pilot Workshop. November 20, 2003. (http://www.theimo.com/imoweb/consult/imoweb\pubs\consult\DmdResp\dr_EcoDRPfinal.pdf)

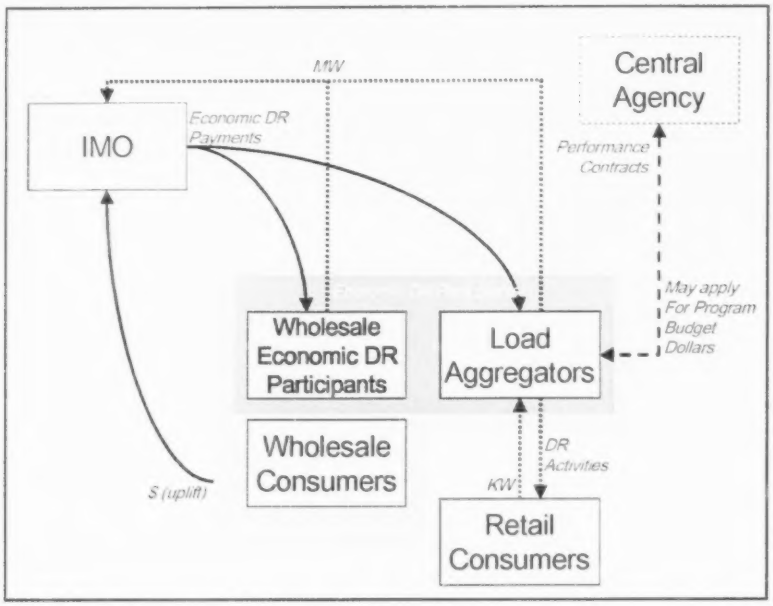


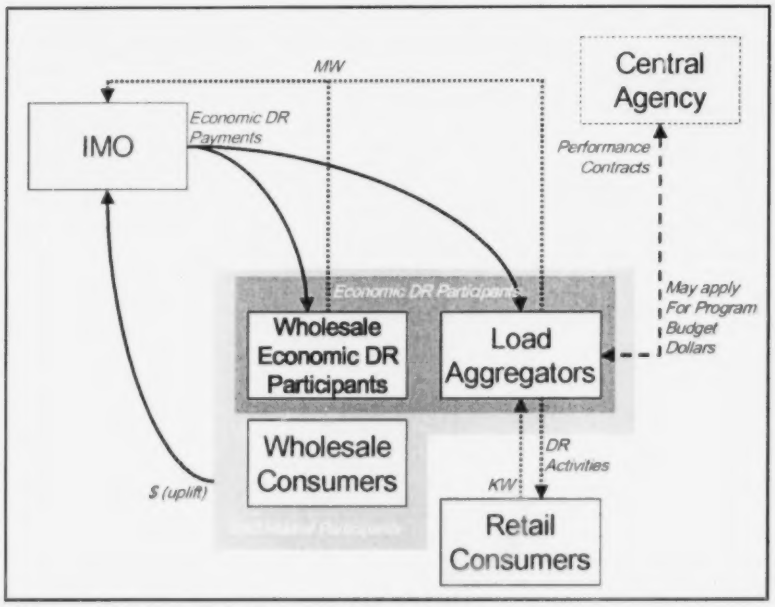
Figure 4: Economic Demand Response

As shown in Figure 4, all IMO-administered market participants will fund the economic DR payments through the uplift charge. Not all wholesale consumers will take part in economic DR programs. Economic DR participants might include wholesale consumers and load aggregators serving retail consumers.

Large industrial consumers have technologies needed to take part in economic DR and many are already market participants. They may participate directly and have already expressed interest to the IMO[25]; however, they would be excluded under the IMO's proposed program.

The role of load aggregation is to gather retail load to participate in the wholesale market. The largest short-term potential is the small industrial and large commercial sectors. i.e. entities that already have interval meters and pay the

[25] The Association of Major Power Consumers of Ontario estimates in its written representation that the potential DR is 1500 MW to 2000 MW.



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hourly Ontario energy price. Likely, many of these would be aggregated across distributor boundaries.

No one player should be mandated to play the role of load aggregator. Some consumers might aggregate their own load to their own benefit. Retailers might aggregate load to manage their commodity risk. Other energy services companies might offer load aggregation as a standalone service in the market.

4.1.2 Potential Concerns

The intent of economic DR is to give payments that will allow participants to build the infrastructure and gain experience to continue demand participation once the payments end. When the deciding factor to curtail load is price then there is a true level of DR in the market. If DR evaporates at the end of an economic DR program then the program has failed.

However, it is also possible that once DR payments end, demand bidding will move to the operating reserve market in search of a payment stream. This would suppress operating reserve prices and generation would likely be pushed into the wholesale market. Consequently, more generation capacity would be available for supply instead of reserve.

The residential sector is unlikely to be addressed by economic DR in the short term because of high transaction costs and uncertain response. Only the ripple control water heater controllers might be useful to reactivate. Other residential initiatives may give better short-term results:

- Time-differentiated commodity prices will cause load shifting. Timers would allow immediate shifting but are not tied to a dynamic price.

- Controllable appliances (either smart controllers or timers) will allow greater consumer flexibility. Smart controllers would build infrastructure for future aggregation.

4.1.3 Implementation

The IMO should establish the objectives for economic DR in terms of the length of the program and the threshold price when it begins to call on economic DR offers.

The IMO should implement economic DR through Market Rule changes and pay for it through the uplift charge since all consumers of the market benefit from the reduction in prices in proportion to their consumption.

4.2 Demand Response in the Retail Market

Recommendation:

The Board is currently working on interim and long-term Standard Supply Service (SSS) pricing strategies. These could include peak and off-peak time-differentiated SSS prices altered seasonally.

Until May 1, 2006, time-differentiated and seasonally adjusted commodity prices could apply to designated consumers.

The Central Agency should consider pilots and demonstration projects for emerging and innovative technologies that enable retail load management; e.g., use of metering technologies, controllers, communications, and/or gateway services.

4.2.1 Rationale

Before market opening, small Ontario consumers were used to a flat price for electricity use. The majority of small consumers then began to be billed based on an unpredictable and volatile spot pass-through applied to their consumption based on a net system load shape (often two months worth of consumption). Introducing a peak and off-peak, time-differentiated price begins an education process for consumers that electrons have different values at different times. This serves as an economic proxy for a market-based price signal.

There is no demonstrated economic justification for mass-deployment of interval meters among existing residential customers based on load shifting. It is not clear that the incremental capital and operating costs of replacing an existing standard meter with an interval meter is less than the demand and consumption savings to the market or to the consumer. Voluntary and mandatory pilot programs have shown that not all consumers have a favorable load shape or have the ability to adjust their usage. However, there is evidence that consumers who are conservation or cost conscious will make behavioral changes based on the clear, predictable signal sent by price levels.

There may be additional benefits to distributors from interval meters, such as account automation and theft detection, that have not been studied locally.

As the policy direction for the Ontario electricity market becomes more certain, it will be possible to determine where smart metering technologies are economically feasible. Costs and benefits will also be easier to calculate.

4.2.2 Potential Concerns

The price differential will have to be great enough to spur shifting in consumption. Pilot programs in Wisconsin have used differences up to 12 to 1[26]. Large price variations may only reflect the commodity price during seasonal peaks where shifting is most desirable.

Any strategy that differs from market-based pricing will create winners and losers. As with the original spot market pass through based on net system load shape, some consumers will be under rewarded for their activities and some consumers will see undue benefit.

4.2.3 Implementation

No legislative change is required. The government has the authority to address elements of SSS pricing by way of regulation.

[26] See materials of oral presentation to the Advisory Group by Schlumberger Electricity, Inc. October 30, 2003.

5 THE IMPORTANCE OF CONSUMER EDUCATION

5.1 Coordinating Communication

Recommendation:

The agencies involved in conservation in Ontario (the government, the Central Agency, the IMO, and the Board), should coordinate consumer education plans to ensure consistent messages and avoid duplication.

To help consumers understand their energy choices and the consequences of those choices in the Ontario market, the Board should design, develop and/or deliver information to consumers related to energy conservation, energy efficiency, load management and cleaner sources of energy.

The government communicates general energy matters and policy direction to consumers. The Board's expanded mandate requires it to communicate to electricity and gas consumers on how the energy markets work and consumer choice in those markets. The IMO communicates with market participants on market function. The Central Agency would communicate DSM/DR program-related information and general conservation information to consumers. Together, they will bring about a conservation culture.

The Board already has a role as an objective leader in protecting energy consumers' interests. Its expanded mandate makes that role clearer. The Board will need to coordinate with other parties. There will be opportunities, for example, to leverage what has been learned from the earlier efforts of government and others.

The Board will also need to consider the best ways of getting information out to consumers (and back from them). It currently uses such channels as letters,

Board Orders, stakeholder presentations and its web site. It may want to add new channels - for example, current rules allow the Board to send information out in energy bills. Examples of ways to communicate valuable information to consumers include presenting historical consumption data on residential bills, and/or using the internet to inform consumers about their consumption and savings possibilities.

The focus of Board communications should be on ensuring that consumers are fully informed of the impact of their decisions. For example, in cooperation with the Central Agency, the message could focus on explaining the potential bill savings (and environmental benefits) of certain energy efficiency improvements.

The Central Agency should look at the activities of market participants already providing consumer-education tools to the public. These include the two major gas distributors, as well as some electricity distributors and energy service providers.

5.1.1 Rationale

Educated consumers will be able to make better choices about how, when and whether they use electricity or gas. They are likely to be more aware of the benefits of shifting or reducing their usage or using other sources. Their feedback, in turn, could help the agencies involved in conservation and the energy sector as a whole to identify other ways of reducing or better managing demand. This would include helping the Central Agency identify opportunities for DSM/DR activities.

5.1.2 Potential Concerns

The goal of consumer education is to create a conservation culture. This will take time. Outcomes may not be immediately tangible. Also, it may be hard to tell how effective the communications efforts are and to judge the benefits.

To avoid the risk that the Board's role or the purpose of its communication might be misunderstood, educational materials must be carefully drafted. For example, the Board should not be seen as promoting a particular activity or technology. This advocacy role should belong to the Central Agency.

Some electricity distributors provide historical consumption data on consumer bills. A few allow consumers to access their account information over the internet. Distributors who invest in technologies and systems that allow this might ask for Ministerial approval of related cost recovery.

5.1.3 Implementation

The Board is already working on its expanded consumer education mandate.

APPENDICES

Appendix A - List of Reports and Stakeholder Oral Presentations and Written Representations.

Adams, Tom. Energy Probe Research Foundation. Notes for Presentation of Energy Probe's Initial Views: OEB Generic DSM/DR Review RP-2003-0144. October 29, 2003

Advisory Group. Report of the Advisory Group. December 12, 2003.

Association of Major Power Consumers in Ontario. Minister's directive on DSM/DR - AMPCO submission to the OEB. November 18, 2003

Buckler, Chris. Enersource Corporation. Seven Steps For An Energy Efficient Ontario. November 10, 2003

Buckler, Chris. Key DSM Strategies and a framework for transition (Presentation).

Burman, Bart. EnerSpectrum. Oral Presentation.

Burman, Bart. EnerSpectrum. Ontario Energy Board Stakeholder Consultations - RP-2003-0144 Minister's directive on DSM and DR October 2003. November 10, 2003

DeRose, Vincent. Industrial Gas Users Association. Written Submission of the Industrial Gas Users Association ("IGUA") on Demand Side Management ("DSM") to the Advisory Committee.

Elenchus Research Associates. Power Workers' Union. Minister's directive on Demand-Side Management and Demand Response - Representation by the Power Workers' Union. November 10, 2003

Farmer, Chuck. Union Gas Limited. Energy Efficiency and Load Management for Ontario's Electricity Market. November 17, 2003

Farmer, Chuck. Demand Side Management 1997 - 2004 (Presentation).

Forsyth, John. Olameter Inc OEB DSM Presentation. October 30, 2003

Fraser, Marion. Canadian Energy Efficience Alliance. Options for Demand Side Management and Demand Response in Ontario.

Gibbons, Jack. Pollution Probe Foundation. An Energy Efficiency Framework for Ontario's Electric Utilities (Presentation). October 20, 2003

Gibbons, Jack. A Framework for Energy Conservation, Energy Efficiency and Load Management (Presentation). October 28, 2003

Grod, Paul M. Rodan Meter services Inc Recommendations for a Demand Side Management and Demand Response Framework in Ontario (File Number RP-2003-0144). November 10, 2003

Hydro One Networks Inc. Electricity Demand in Ontario: Submitted to the Ontario Energy Board regarding RP-2003-0144, November, 2003.

Independent Electricity Market Operator. Submissions of the Independent Electricity Market Operator. November 19, 2003

Johnson Controls L.P. Position Paper on Energy Market Development to Foster Improved and Effective Implementation of DSM and DR. November 17, 2003

Kee, Sheila & Scott Owen. Schlumberger Electricity Metering. DSM and Metering (Presentation). October 30, 2003

Kushler, Martin, Ph.D. Energy Efficiency Principles and Conclusions Derived from U.S. Experience (Presentation). October 29, 2003

Kushler, Martin, Ph.D. Written Comments to the Ontario Energy Board Re: Demand Side Management and Demand Response in the Ontario Energy Sectors. October 29, 2003

Lenarduzzi, Frank. Terra Power Systems Inc. Open Letter to the Advisory Group on Demand Side Management & Demand Response (DSM & DR). November 10, 2003

Lenarduzzi, Frank. Strategic Review of Demand-Side Management and Demand Response (Presentation).

MacDonald, Alex. Virtual Power Plant.

McClenaghan, Theresa. Canadian Environmental Law Association. DSM for low-income consumers in Ontario. November 10, 2003

Morris, Richard. Better Buildings Partnership. RP-2003-0144 – Participation from Listed Stakeholders. November 10, 2003

Mountain, Dean. McMaster Institute for Energy Studies. RP-2003-0144.

Nolan, Dennis. Hydro Vaughan Distribution Inc. RP-2003-0144 Participation from Listed Stakeholders Consultation on DSM and DR. November 10, 2003

Ontario Energy Board Staff. Demand-Side Management and Demand Response in the Ontario Energy Sectors. October 6, 2003.

Posh, David. Green Energy Coalition (GEC). Demand-Side Management and Demand Response in the Ontario Energy Sectors - GEC's Initial Views on the OEB Discussion Paper Issues.

Ronchka, Richard. Measurement Issues Associated with DSM (Presentation).

Ronchka, Richard. OZZ Corporation. Written Submission ro RP-2003-1044. November 04, 2003

Singleton, Mike. Sustainable Buildings Canada. A Submission by Sustainable Buildings Canada November, 2003.

Squires, Pat. Enbridge Gas Distribution Inc. Principles and Frameworks for DSM in Ontario A Policy Paper by Enbridge Gas Distribution. November 17, 2003

Squires, Pat. Demand-Side Management at Enbridge - Lessons Learned (Presentation). October 29, 2003

Struthers, Dale. BOMA Toronto. Presentation to OEB DSM/DR Advisory Group.

Thorne, Don, Brian Denney, Ian Jarvis. Milton Hydro Distribution Inc RP-2003-0144 Demand-Side Management and Demand Response in the Ontario Energy Sectors. November 03, 2003

Torrie, Ralph. Electricity Productivity, "DSM" and Sustainable Futures for Ontario (Presentation).

VECC Comments of Board Staff Discussion Paper. November 10, 2003

Weber, Brian (Grimsby Power). Grimsby Power Incorporated. RP-2003-0144. October 17, 2003

Wong, Angela. Ontario Power Generation Inc. Written Submission of Ontario Power Generation Inc. to the Consultation on Demand Side Management (DSM) and Demand Response (DR). November 17, 2003

Zebrowski, Richard. Presentation by Toronto Hydro.

Zebrowski, Richard. Toronto Hydro Corporation. Key Points of Toronto Hydro Position. November 17, 2003